CLAIMS

1   1.   A method for initiating a peer-to-peer communication session, the method com-

2   prising the steps of:

3   attempting a first remote direct memory access (RDMA) read operation directed

4   to a cluster partner;

5   performing, in response to a successful first RDMA read operation, a first RDMA

6   write operation to the cluster partner;

7   performing, in response to a successful RDMA write operation, a second RDMA

8   read operation directed to the cluster partner; and

9   performing, in response to a successful second RDMA read operation, a second

10   RDMA write operation to the cluster partner.

1   2.   The method of claim 1 wherein the step of attempting a first RDMA read opera-

2   tion further comprises the step of issuing a RDMA read operation to the cluster partner

3   requesting a pre-set memory address location that is associated with a status variable on

4   the cluster partner.

1   3.   The method of claim 1 further comprising the steps of:

2   exchanging a set of peer connection information;

3   passing a set of client information to the cluster partner;

4   creating a set of appropriate communication ports;

5   alerting the cluster partner of a ready status; and

6   alerting a set of clients that the cluster partner is in a ready state.

1   4.   The method of claim 3 wherein the set of peer connection information comprises

2   a version number.

1   5.   The method of claim 1 wherein the step of passing a set of client information to

2   the cluster partner further comprises the steps of:

3   collecting, from a set of clients, the set of client information; and

4   transferring the collected set of client information to the cluster partner.

1   6.   The method of claim 5 wherein the client information comprises a number of

2   communication ports required.

1   7.   The method of claim 5 wherein the set of client information further comprises an

2   amount of memory requested by a particular client.

1   8.   The method of claim 1 wherein the cluster partner is a storage system.

1   9.   The method of claim 1 wherein the cluster partner is an application server.

1   10.   A storage operating system, executing on a storage system, the storage operating

2   system comprising:

3   a cluster connection manager adapted to initiate a peer to peer communication

4   session with a cluster partner upon initialization of the storage operating system.

1   11.   The storage operating system of claim 10 wherein the cluster connection manager

2   further comprises:

3   means for performing a remote first direct memory access (RDMA) read opera-

4   tion directed to a cluster partner;

5   means for performing, in response to a successful first RDMA read operation, a

6   first RDMA write operation to the cluster partner;

7   means for performing, in response to a successful first RDMA write operation, a

8   second RDMA read operation directed to the cluster partner; and

9   means for performing, in response to a successful second RDMA read operation,

10   a second RDMA write operation to the cluster partner.

1   12.   The storage operating system of claim 11 wherein the cluster connection manager

2   further comprises:

3   means for exchanging a set of peer connection information;

4   means for passing a set of client information to the cluster partner;

5   means for creating a set of appropriate communication ports;

6   means for alerting the cluster partner of a ready status; and

7   means for alerting a set of clients that the cluster partner is in a ready state.

1   13.   A method for initiating a peer-to-peer communication session, the method com-

2   prising the steps of:

3   performing a first remote direct memory access read operation directed to a clus-

4   ter partner; and

5   performing, in response to a successful first remote direct memory access read

6   operation, a first remote direct memory access write operation to the cluster partner.

1   14.   The method of claim 13 wherein the first remote direct memory access read op-

2   eration is performed over a Virtual Interface connection having a pre-determined and pre-

3   assigned Virtual Interface Number and a pre-determined Fibre Channel ID.

1   15.   A method for initiating a peer-to-peer communication session, the method com-

2   prising the steps of:

3   (a) attempting a first remote direct memory access read operation directed to a

4   predefined hardware address and a predefined port number; and

5   (b) performing, in response to a successful step (a), a first remote direct memory

6   access write operation directed to the predefined hardware address and the predefined

7   port number..

1   16.   The method of claim 16 further comprising the step of:

2   (c) performing; in response to a successful step (b), a second remote direct mem-

3   ory access read operation directed to the predefined hardware address and the predefined

4   port number.

1   17.   The method of claim 15 wherein the predefined hardware address comprises a

2   fibre channel identifier.

1 18.   The method of claim 15 wherein the predefined port number comprises a virtual

2 interface.

1 19.   The method of claim 15 wherein the first remote direct memory access is deliv-

2 ered to a predefined memory address storing booting status information.

1 20. A system configured to establish reliable peer-to-peer communication among storage

2 systems of a clustered environment, the system comprising:

3   a peer process executing on each storage system partner; and

4   a cluster connection manager executing on each storage system partner, the clus-

5 ter connection manager establishing a reliable peer-to-peer connection between each peer

6 process by connecting to a predetermined port number using a predetermined network

7 address.

1 21. The system of claim 20 wherein the reliable peer-to-peer connection is established

2 without requiring a storage operating system executing on each storage system partner to

3 be fully functioning.

1 22. The system of claim 20 wherein the peer-to-peer connection is a virtual interface

2 connection.

1 23. The system of claim 20 wherein the peer process is a cluster connection client that

2 requests services from the cluster connection manager.